Contact Lens Complications & Management

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Contact lenses are used to correct refractive error, improve visual acuity, and enhance appearance for cosmetic reasons. Improper use of contact lenses can cause numerous complications, which are manifested in various clinical signs and symptoms. These complications affect about 4 percent of the ophthalmic patient population. Chronic contact lens complications can have long-term effects such as decrease in corneal thickness as well as increase cornea curvature and surface irregularities. Contact lenses can also cause injury to the cornea through mechanical factors or from lens deposits. This can occur in microtrauma by inducing inflammatory cytokines directly, or in the case of deposits, serving as antigens to trigger an immune response leading to infiltrates.

Proper diagnosis and treatment is essential in maintaining optimal health for the affected contact lens patients. This newsletter will review common complications associated with contact lens use and their appropriate management.

Contact lens complications can be infectious or non-infectious and the American Optometric Association further classifies them according to location.

Table: 1.0

Location	Noninfectious Complications	Infectious Complications
Eyelids	Toxicity, Allergy, Ptosis Meibomian Gland Dysfunction	Blepharitis
Conjunctiva	Injection, Edema, Staining, Giant Papillary Conjunctivitis	Bacterial Conjunctivitis Viral Conjunctivitis.
Cornea (all layers)	Hypoxia, Abrasion, Distortion and warpage, Reactions to contact lens solutions, Corneal infiltrates, Epithelial stainings, Edema, 3/9 staining, Foreign body tracking, Dimple veil, blebs, Neovascularizations, Superficial cornea pannus, Dry eyes.	**Microbial corneal infections.** **Amoebic** (Acanthamoeba), **Bacterial:** Gram (+) Staph. Aureus, Gram (+) Staph Epidermidis Gram (-)Pseudomonas Aeruginosa**.** **Fungal infections,** **Viral :** Adenovirus Herpes simplex virus.

Overview, Diagnosis and Management of Contact Lens Complications

Dry Eyes

Dry eye is a common disorder of the tear film characterized by tear volume deficiency or excessive tear evaporation. The contact lens patient with dry eyes is first diagnosed through subjective complaints like burning, dryness, irritation, blurry vision when wearing contacts for a prolonged period. Clinical exam often reveals meibomian gland dysfunction, reduced inferior tear prisms, and excessive debris in the tear layer. Dry eyes can worsen and complicate contact lens wear in about 50 percent of patients such that those patients are often intolerant of contact lens wear.

Diagnosis: Diagnostic tests such as tear breakup time, Schirmer test, phenol red thread tests, rose bengal/lissamine green staining can be used to determine the extent of the dry eyes.

Management: Simple treatments include; Use of rewetting drops, especially the preservative free for those with extreme sensitivity, proper lid and lens hygiene to reduce incidence of protein deposits. Resoaking lenses during the day to improve comfort as well as more frequent blinking can help bring relief. One can also consider changing the lens material. In recalcitrant cases, more aggressive therapy like punctual plugs and immunomodulating topical drugs like Restasis can be used.

Neovascularization

Neovascularization or new vessel growth can be seen at the limbus in cases of chronic hypoxia from contact lens wear.

Diagnosis: Neovascularization is characterized by the growth of blood vessels into the normally avascular cornea to supply oxygen and nutrients to this tissue.. This is more commonly seen in patients using soft extended contact lenses or wearing daily wear contacts, especially the thick-edged high-minus soft lenses of low Dk/t, or with the equally thick and low Dk/t inferior edges of soft toric lenses. In patients wearing rigid gas permeable contacts, **pannus** can occur from epithelial desiccation, and is characterized by chronic 3 and 9 o'clock staining.

Management: This can be achieved by switching to a more appropriate contact lens material, refitting with an RGP lens, or reducing the wearing schedule. Again, the condition may resolve with complete cessation of lens wear. Compliance to whatever regimen set forth by the optometrist is very important.

Corneal Hypoxia:

Corneal hypoxia is one of the most common complications of contact lens wear and in this condition the cornea is deprived of much needed oxygen. The cornea has no blood supply of its own, so it gets oxygen only from tears and directly from the atmosphere. Contact lenses reduce the oxygen supply to the cornea, making the cornea swell. Thus, hypoxia can cause corneal changes like microcysts, central corneal clouding, reduced sensitivity, adhesions and in some instances infiltrates. Hypoxia can induce a change in most corneal layers in the form of striae, more than 2mm of corneal pannus that is unrelated to 3 and 9 o'clock staining, endothelial blebs, and stroma thickening. If

persistent, chronic hypoxia can lead to a condition known as "corneal exhaustion syndrome," or CES.

Management:

We can start by a reduction in wearing schedule for contacts in those with compromised corneas. Most contact lens-related complications have an increased prevalence and severity when worn on an extended or continuous basis, therefore restricting contact lens use to daily wear whenever hypoxia is present would help minimize the occurrence of these complications. Other options include; changing the lens material to a higher Dk material or to an enhanced tear exchange design that will increase the availability of oxygen to the anterior corneal surface.

Microcysts:

Microcysts are small (15 μm to 50 μm), irregularly shaped inclusions commonly found in the paracentral to mid-peripheral zones of the cornea, which develop secondary to hypoxia and reduced epithelial regeneration.

Diagnosis: They are observed best on the slit lamp in retro-illumination. Microcysts show reversed illumination due to a suspected higher refractive index than the surrounding tissue. Patients with microcysts rarely report symptoms.

Management: These patients should be fitted with the highest tolerable Dk silicone hydrogel lens possible.

Contact Lens-induced Acute Red Eye (CLARE)

This is defined as a sudden onset of corneal infiltration during extended wear of hydrogel contact lenses seemingly occurring with sleep. Patients often wake up with uniocular pain, irritation or foreign body sensation, redness and watering. It is characterized as a non-ulcerative, sterile keratitis associated with colonization of Gram-negative bacteria on contact lenses; mostly pseudomonas specie; but sometimes Serratia marscesens and Haemophilus influenza. These gram negative bacteria adhere to contact lenses, release endotoxins and recruit inflammatory cells.

Diagnosis:

Visual acuity is unaffected. Examination reveals focal or diffuse sub-epithelial infiltrates in the mid-periphery of the cornea near the limbus. There is marked circumferential limbal injection, but no cells or flare in the anterior chamber or lid edema. It can occur with well-fitted or immobile lenses of any material or oxygen transmission and can be a recurrent condition in some patients.

Management:

Since CLARE is non-ulcerative and non-infectious, it will subside with temporary discontinuation of contact lens wear along with aggressive ocular lubrication to ameliorate the signs and symptoms. In addition, switching to daily wear lenses in recurrent cases is also suggested. If the lenses were fit too steep, flatter base curve is recommended.

Contact Lens-Related Superior Limbic Keratoconjunctivitis (CLKC)

Contact Lens-Related Superior Limbic Keratoconjunctivitis or (CLKC) usually starts after 2 months to as long as 3 years of lens wear, during which the patient may complain of burning, itching, red eyes with increased secretions and .photophobia.

The clinical signs of CLKC include;

- Injection of the superior bulbar conjunctiva,
- Punctate staining of the superior limbus and cornea ,
- Epithelial and sub epithelial opacities,
- Superior corneal vascularization ,
- Fine papillary hypertrophy of the superior tarsus.

The corneal changes seen with CLKC often reduce visual acuity due to the inflammatory events which often encroach into the pupillary zone. The corneal changes often start at the superior limbus and progress toward the pupil. **Treatment** includes decreasing wearing time, refitting into a more appropriate lens material and cessation of contact lens wear in severe cases. In severe cases, one may consider the use of topical steroids.

Contact Lens-induced Peripheral Ulcer (CLPU)

CLPU is defined as a circular, well-circumscribed, dense, yellowish-white, focal corneal infiltrate (0.2 mm to 2.0 mm in diameter) located in the peripheral to mid-peripheral cornea. It is always located in the anterior stroma and has a complete loss of overlying epithelium. Symptoms can vary but may include pain or soreness, irritation and watering.

Diagnosis: Differentiate CLPU from Microbial Keratitis (MK) by noting that in CLPU, there is reduction of severity of signs and symptoms after lens wear is discontinued. There is less likely to be significant inflammation and anterior chamber reaction (flare and cells, possible hypopyon).

Management: Treat appropriately with topical fluoroquinolones and discontinue lens wear till the ulcer heals. It is recommended that the patient discards their current contact lenses even after resolution.

Superior Epithelial Arcuate Lesion (SEAL)

SEAL is defined as a thin, arcuate white lesion in the superior cornea, usually located within 1 mm to 3 mm of the superior limbus between 10 and 2 o'clock. They can be up to 0.5 mm wide and range from 1 mm to 5 mm in length. High Dk silicone hydrogel lenses have overcome many of the hypoxic problems associated with traditional extended wear, but seem to contribute to the formation of these non-inflammatory lesions as a result of mechanical disturbances or trauma when wearing silicone hydrogel lenses.

Diagnosis: The characteristic finding in SEAL is the presence of the peripheral white lesion, which should be obvious even without the use of vital stains. **Management:** Switch from High Dk lens. Lubrication with artificial tears as needed.

Contact Lens-induced Papillary Conjunctivitis (CLPC)

CLPC can occur from mechanical abrasion from poor edge design and protein film abrasiveness. It may present as a localized or generalized response. Symptoms include itching and a stringy or ropy mucous discharge. Excessive lens movement or decentration and blurred vision have also been known to occur.

Diagnosis: Signs of CLPC range from mild hyperemia of the upper tarsal conjunctiva with a few, small papillae to severe hyperemia with large, raised cobblestone-like papillae.

Management: Lens material, design or fitting characteristics may need to be modified to prevent recurrence of this condition. Anti-histamines are not very effective. Modern silicone hydrogel lens designs are a good choice for a treatment option.

Microbial Keratitis (MK)

Microbial keratitis occurs due to a corneal infection by replicating micro-organisms (bacterial, viral, fungal or amoebae). In contact lens wear, it is usually preceded by hypoxia and/or an epithelial break. Extended contact lens wearers are more prone to develop MK. Contact lens-related MK is most commonly caused by the Staphylococcus species. Symptoms of MK include rapidly increasing pain, severe redness, intense epiphora and photophobia.

Diagnosis: Paracentral or central lesions can have full thickness loss, raised edges and an irregular appearance. Anterior chamber cell and flare also may be present.

Management: Discontinue contact lens wear. Aggressive treatment of lesion with topical ophthalmic anti-microbials is necessary. Flouroquinolones should be used according to established protocols for ulcer treatment. Avoid use of topical steroid in infectious keratitis especially if epithelium is not intact. Close follow-up is recommended to monitor resolution or severity.

Exposure Keratitis

Exposure keratitis or Keratoconjunctivitis occurs due to incomplete closure of the eyelid causing dry, inflamed eye. **Diagnosis:** Significant punctuate staining is seen, especially on the inferior aspect of cornea.

Management: A therapeutic contact lens that can stay on the eye safely overnight and protect the cornea from desiccation. In addition, lubrication during the day with tear supplements and ointment at bedtime can considered.

Infiltrates:

These can be round or dendritic and may be caused by contact lens solution sensitivities, hypoxia, microbial infection, or unrelated complications such as adenoviral infection. Be cautious to rule out herpes virus infection or acanthamoeba keratitis masquerading as sterile infiltrate.

Diagnosis: Infiltrates are usually of infectious etiology if they are single rather than multiple; are large rather than small; and are associated with pain, photophobia; and an

epithelial defect. Presence of adnexal inflammation (injected conjunctiva, swollen lid and anterior chamber reactions) also suggests infection.

Management: Assume all contact lens-associated corneal infiltrates to be infectious until proven otherwise. The patients should discontinue contact lens wear, and then treat aggressively with topical antibiotics and monitor closely. One can use topical aminoglycosides like tobramycin or fluroquinolones like (norfloxacin, ofloxacin or ciprofloxacine) QID

Contact Lens Solution Reaction

There are several lens cleaning options currently available like multipurpose solutions, hydrogen peroxide solution and enzymatic cleaners. Multipurpose solutions are the most popular cleaning solution for contact lenses and are used for rinsing, disinfecting, cleaning and storing the lenses, thus eliminating the need for protein removal enzyme tablets in most cases. Some multipurpose solutions are ineffective at disinfecting *Acanthamoeba* from the lens..

Hydrogen peroxide solution: These are available as 'two-step' or 'one-step' systems. If using a 'two-step' product, ensure that the lens taken out of the hydrogen peroxide is neutralized before it is worn to avoid extreme pain. Saline must be used to rinse away the peroxide.

Enzymatic cleaner – These are used for cleaning protein deposits off lenses Typically, this cleaner is in tablet form. Protein deposits make use of contact lenses uncomfortable and may lead to various eye problems. To counteract minor contamination of the product and kill microorganisms on the contact lens, some products may contain preservatives such as thiomersal, benzalkonium chloride, benzyl alcohol, and other compounds. In 1989, thiomersal was responsible for about 10% of problems related to contact lenses. As a result, many products no longer contain thimerosal. Preservative-free products usually have shorter shelf life. With the introduction of silicone-hydrogel polymers, some soft contact lens materials may be incompatible with some solutions resulting in corneal staining, therfore a careful selection of cleaning products is recommended.

Diagnosis: Most solution reactions are cell-mediated reactions to preservatives, such as thimerosal, and usually have non-specific anterior segment signs. A good history including lens cleaning method is important in diagnosing a contact lens complication. Some solutions can result in toxic reactions in patients and can present as mild to severe patient discomfort, corneal staining (usually fine) with or without infiltrates, and conjunctival injection and/or edema. There may be tarsal follicles or papillae.

Management: Educate your patient to switch lens care products, instruct the patients to discontinue contact lens wear if needed and initiate appropriate treatment and monitoring. Treat just as you would an epithelial defect. You can consider adding a topical steroid or NSAID once you are certain there is no infection and that the corneal epithelium is intact. Once resolved, you can refit into daily disposables to minimize the risk of solution reactions. To prevent Acanthamoeba infection, discourage the use of tap water or fresh water to rinse contact lenses.

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QEI 2008 Contact Lens Complications & Management Test

1) Which of the following is not an example of an Infectious Contact Lens Complication?

a) Viral Conjunctivitis
b) Acanthamoeba Keratitis
c) Giant Papillary Conjunctivitis
d) Herpetic Keratitis
e) Bacterial Infiltrate

2) Which of the following tests can be used to diagnose Dry Eyes?

a) Schirmer Test
b) Phenol red thread test
c) Rose Bengal test
d) Tear break up time
e) All of the above

3) Which of the following are true about corneal hypoxia?

a) Can appear as microcysts and central corneal clouding
b) Can induce formation of striae and stromal thickening.
c) If chronic , can cause corneal exhaustion syndrome
d) Can be managed by switching to a higher Dk lens material
e) All of the above

4) Which of the following is characteristic of Contact Lens-induced Acute Red Eye (CLARE)

a) Does not affect visual acuity
b) It is non-infectious
c) It is non-ulcerative
d) Symptoms appear mainly upon waking from sleep
e) All of the above

5) Which of the following is a false statement about Superior Epithelial Arcuate Lesion (SEAL)?

a) Primarily found in the superior cornea
b) Can be caused by wearing high Dk lenses
c) Occur as thin, arcuate white lesions
d) All of the above
e) None of the above.

6) Which of the following does not describe an infectious infiltrate?

a) Small
b) Single
c) Large
d) Hypopyon
e) Photophobia

7) Which one of the following is a false statement about contact lens solution complications?
(This is a confusing question to answer: should be d since all are correct statements)

a) Cleaning lenses with tap water can cause Acanthamoeba infection
b) Hydrogen peroxide must be irrigated if it spills in eye
c) You can treat with a steroid or NSAID(non-steroidal anti-inflammatory) drop if the epithelium is intact
d) Causes corneal staining with or without infiltrates
e) None of the above
f) All of the above

8) CLPU is defined as a

a) circular, well-circumscribed, dense, yellowish-white, focal corneal infiltrate (0.2 mm to 2.0 mm in diameter)
b) circular, well-circumscribed, dense, greenish-white, focal corneal infiltrate (0.6 mm to 2.5 mm in diameter)
c) Square, well-circumscribed, dense, yellowish-blue, focal corneal infiltrate (0.7 mm to 4.0 mm in diameter)
d) b and a are both correct
e) None of the above

9) The most common microbe associated with contact lens-related MK is a bacteria called? (Are you certain pseudomonas is correct?)

a) Pseudomonas aeruginosa.
b) Staph. Aureus
c)Staph. Epidermidis
d) All of the above

10: Which of these statements is true?

(a) Contact lens complications affect about 24 percent of the ophthalmic patient population
(b) Contact lens complications affect about 14 percent of the ophthalmic patient population
(c) Contact lens complications do not affect 4 percent of the ophthalmic patient population
(d) Contact lens complications affect about 4 percent of the ophthalmic patient population
(e) None of the above